```
                ;       MDS-800 I/O DRIVERS FOR CP/M 2.2
                ;       (FOUR DRIVE SINGLE DENSITY VERSION)
                ;
                ;       VERSION 2.2 FEBRUARY, 1980
                ;
0016 =          VERS    EQU     22      ;VERSION 2.2
                ;
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                ;       CALIFORNIA, 93950
                ;
                ;
FFFF =          TRUE    EQU     OFFFFH  ;VALUE OF "TRUE"
0000 =          FALSE   EQU     NOT TRUE        ;"FALSE"
0000 =          TEST    EQU     FALSE   ;TRUE IF TEST BIOS
                ;
                        IF      TEST
                BIAS    EQU     03400H  ;BASE OF CCF IN TEST SYSTEM
                        ENDIF
                        IF      NOT TEST
0000 =          BIAS    EQU     0000H   ;GENERATE RELOCATABLE CP/M SYSTEM
                        ENDIF
                ;
1600 =          PATCH   EQU     1600H
                ;
1600                    ORG     PATCH
0000 =          CPMB    EQU     $-PATCH ;BASE OF CPM CONSOLE PROCESSOR
0806 =          BDOS    EQU     806H+CPMB       ;BASIC DOS (RESIDENT PORTION)
1600 =          CPML    EQU     $-CPMB  ;LENGTH (IN BYTES) OF CPM SYSTEM
002C =          NSECTS  EQU     CPML/128        ;NUMBER OF SECTORS TO LOAD
0002 =          OFFSET  EQU     2       ;NUMBER OF DISK TRACKS USED BY CP/M
0004 =          CDISK   EQU     0004H   ;ADDRESS OF LAST LOGGED DISK ON WARM START
0080 =          BUFF    EQU     0080H   ;DEFAULT BUFFER ADDRESS
000A =          RETRY   EQU     10      ;MAX RETRIES ON DISK I/O BEFORE ERROR
                ;
                ;       PERFORM FOLLOWING FUNCTIONS
                ;       BOOT    COLD START
                ;       WBOOT   WARM START (SAVE I/O BYTE)
                ;       (BOOT AND WBOOT ARE THE SAME FOR MDS)
                ;       CONST   CONSOLE STATUS
                ;               REG-A = 00 IF NO CHARACTER READY
                ;               REG-A = FF IF CHARACTER READY
                ;       CONIN   CONSOLE CHARACTER IN (RESULT IN REG-A)
                ;       CONOUT  CONSOLE CHARACTER OUT (CHAR IN REG-C)
                ;       LIST    LIST OUT (CHAR IN REG-C)
                ;       PUNCH   PUNCH OUT (CHAR IN REG-C)
                ;       READER  PAPER TAPE READER IN (RESULT TO REG-A)
                ;       HOME    MOVE TO TRACK 00
                ;
                ;       (THE FOLLOWING CALLS SET-UP THE IO PARAMETER BLOCK FOR THE
                ;       MDS, WHICH IS USED TO PERFORM SUBSEQUENT READS AND WRITES)
                ;       SELDSK  SELECT DISK GIVEN BY REG-C (0,1,2...)
                ;       SETTRK  SET TRACK ADDRESS (0,...76) FOR SUBSEQUENT READ/WRITE
                ;       SETSEC  SET SECTOR ADDRESS (1,...,26) FOR SUBSEQUENT READ/WRITE
                ;       SETDMA  SET SUBSEQUENT DMA ADDRESS (INITIALLY 80H)
```

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```
                        ;
                        ;       (READ AND WRITE ASSUME PREVIOUS CALLS TO SET UP THE IO PARAMETE
                        ;       READ    READ TRACK/SECTOR TO PRESET DMA ADDRESS
                        ;       WRITE   WRITE TRACK/SECTOR FROM PRESET DMA ADDRESS
                        ;
                        ;       JUMP VECTOR FOR INDIVIUAL ROUTINES
1600 C3B316             WBOOTE: JMP     BOOT
1603 C3C316                     JMP     WBOOT
1606 C36117                     JMP     CONST
1609 C36417                     JMP     CONIN
160C C36A17                     JMP     CONOUT
160F C36D17                     JMP     LIST
1612 C37217                     JMP     PUNCH
1615 C37517                     JMP     READER
1618 C37817                     JMP     HOME
161B C37D17                     JMP     SELDSK
161E C3A717                     JMP     SETTRK
1621 C3AC17                     JMP     SETSEC
1624 C3BB17                     JMP     SETDMA
1627 C3C117                     JMP     READ
162A C3CA17                     JMP     WRITE
162D C37017                     JMP     LISTST  ;LIST STATUS
1630 C3B117                     JMP     SECTRAN
                        ;
                                MACLIB  DISKDEF ;LOAD THE DISK DEFINITION LIBRARY
                                DISKS   4       ;FOUR DISKS
1633+=                  DPBASE  EQU     $       ;BASE OF DISK PARAMETER BLOCKS
1633+82160000           DPE0:   DW      XLT0,0000H      ;TRANSLATE TABLE
1637+00000000                   DW      0000H,0000H     ;SCRATCH AREA
163B+6E187316                   DW      DIRBUF,DPB0     ;DIR BUFF,PARM BLOCK
163F+0D19EE18                   DW      CSV0,ALV0       ;CHECK, ALLOC VECTORS
1643+82160000           DPE1:   DW      XLT1,0000H      ;TRANSLATE TABLE
1647+00000000                   DW      0000H,0000H     ;SCRATCH AREA
164B+6E187316                   DW      DIRBUF,DPB1     ;DIR BUFF,PARM BLOCK
164F+3C191D19                   DW      CSV1,ALV1       ;CHECK, ALLOC VECTORS
1653+82160000           DPE2:   DW      XLT2,0000H      ;TRANSLATE TABLE
1657+00000000                   DW      0000H,0000H     ;SCRATCH AREA
165B+6E187316                   DW      DIRBUF,DPB2     ;DIR BUFF,PARM BLOCK
165F+6B194C19                   DW      CSV2,ALV2       ;CHECK, ALLOC VECTORS
1663+82160000           DPE3:   DW      XLT3,0000H      ;TRANSLATE TABLE
1667+00000000                   DW      0000H,0000H     ;SCRATCH AREA
166B+6E187316                   DW      DIRBUF,DPB3     ;DIR BUFF,PARM BLOCK
166F+9A197B19                   DW      CSV3,ALV3       ;CHECK, ALLOC VECTORS
                                DISKDEF 0,1,26,6,1024,243,64,64,OFFSET
1673+=                  DPB0    EQU     $               ;DISK PARM BLOCK
1673+1A00                       DW      26              ;SEC PER TRACK
1675+03                         DB      3               ;BLOCK SHIFT
1676+07                         DB      7               ;BLOCK MASK
1677+00                         DB      0               ;EXTNT MASK
1678+F200                       DW      242             ;DISK SIZE-1
167A+3F00                       DW      63              ;DIRECTORY MAX
167C+C0                         DB      192             ;ALLOC0
167D+00                         DB      0               ;ALLOC1
167E+1000                       DW      16              ;CHECK SIZE
1680+0200                       DW      2               ;OFFSET
1682+=                  XLT0    EQU     $               ;TRANSLATE TABLE
```

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```
1682+01                 DB      1
1683+07                 DB      7
1684+0D                 DB      13
1685+13                 DB      19
1686+19                 DB      25
1687+05                 DB      5
1688+0B                 DB      11
1689+11                 DB      17
168A+17                 DB      23
168B+03                 DB      3
168C+09                 DB      9
168D+0F                 DB      15
168E+15                 DB      21
168F+02                 DB      2
1690+08                 DB      8
1691+0E                 DB      14
1692+14                 DB      20
1693+1A                 DB      26
1694+06                 DB      6
1695+0C                 DB      12
1696+12                 DB      18
1697+18                 DB      24
1698+04                 DB      4
1699+0A                 DB      10
169A+10                 DB      16
169B+16                 DB      22
                        DISKDEF 1,0
1673+=          DPB1    EQU     DPB0    ;EQUIVALENT PARAMETERS
001F+=          ALS1    EQU     ALS0    ;SAME ALLOCATION VECTOR SIZE
0010+=          CSS1    EQU     CSS0    ;SAME CHECKSUM VECTOR SIZE
1682+=          XLT1    EQU     XLT0    ;SAME TRANSLATE TABLE
                        DISKDEF 2,0
1673+=          DPB2    EQU     DPB0    ;EQUIVALENT PARAMETERS
001F+=          ALS2    EQU     ALS0    ;SAME ALLOCATION VECTOR SIZE
0010+=          CSS2    EQU     CSS0    ;SAME CHECKSUM VECTOR SIZE
1682+=          XLT2    EQU     XLT0    ;SAME TRANSLATE TABLE
                        DISKDEF 3,0
1673+=          DPB3    EQU     DPB0    ;EQUIVALENT PARAMETERS
001F+=          ALS3    EQU     ALS0    ;SAME ALLOCATION VECTOR SIZE
0010+=          CSS3    EQU     CSS0    ;SAME CHECKSUM VECTOR SIZE
1682+=          XLT3    EQU     XLT0    ;SAME TRANSLATE TABLE
                ;       ENDEF OCCURS AT END OF ASSEMBLY
                ;
                ;       END OF CONTROLLER - INDEPENDENT CODE, THE REMAINING SUBROUTINES
                ;       ARE TAILORED TO THE PARTICULAR OPERATING ENVIRONMENT, AND MUST
                ;       BE ALTERED FOR ANY SYSTEM WHICH DIFFERS FROM THE INTEL MDS.
                ;
                ;       THE FOLLOWING CODE ASSUMES THE MDS MONITOR EXISTS AT 0F800H
                ;       AND USES THE I/O SUBROUTINES WITHIN THE MONITOR
                ;
                ;       WE ALSO ASSUME THE MDS SYSTEM HAS FOUR DISK DRIVES
00FD =          REVRT   EQU     0FDH    ;INTERRUPT REVERT PORT
00FC =          INTC    EQU     0FCH    ;INTERRUPT MASK PORT
00F3 =          ICON    EQU     0F3H    ;INTERRUPT CONTROL PORT
007E =          INTE    EQU     0111$1110B      ;ENABLE RST 0(WARM BOOT), RST 7 (MONITO
                ;
```

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```
                ;       MDS MONITOR EQUATES
F800 =          MON80   EQU     0F800H  ;MDS MONITOR
FF0F =          RMON80  EQU     0FF0FH  ;RESTART MON80 (BOOT ERROR)
F803 =          CI      EQU     0F803H  ;CONSOLE CHARACTER TO REG-A
F806 =          RI      EQU     0F806H  ;READER IN TO REG-A
F809 =          CO      EQU     0F809H  ;CONSOLE CHAR FROM C TO CONSOLE OUT
F80C =          PO      EQU     0F80CH  ;PUNCH CHAR FROM C TO PUNCH DEVICE
F80F =          LO      EQU     0F80FH  ;LIST FROM C TO LIST DEVICE
F812 =          CSTS    EQU     0F812H  ;CONSOLE STATUS 00/FF TO REGISTER A
                ;
                ;       DISK PORTS AND COMMANDS
0078 =          BASE    EQU     78H     ;BASE OF DISK COMMAND IO PORTS
0078 =          DSTAT   EQU     BASE    ;DISK STATUS (INPUT)
0079 =          RTYPE   EQU     BASE+1  ;RESULT TYPE (INPUT)
007B =          RBYTE   EQU     BASE+3  ;RESULT BYTE (INPUT)
                ;
0079 =          ILOW    EQU     BASE+1  ;IOPB LOW ADDRESS (OUTPUT)
007A =          IHIGH   EQU     BASE+2  ;IOPB HIGH ADDRESS (OUTPUT)
                ;
0004 =          READF   EQU     4H      ;READ FUNCTION
0006 =          WRITF   EQU     6H      ;WRITE FUNCTION
0003 =          RECAL   EQU     3H      ;RECALIBRATE DRIVE
0004 =          IORDY   EQU     4H      ;I/O FINISHED MASK
000D =          CR      EQU     0DH     ;CARRIAGE RETURN
000A =          LF      EQU     0AH     ;LINE FEED
                ;
                SIGNON: ;SIGNON MESSAGE: XXK CP/M VERS Y.Y
169C 0D0A0A             DB      CR,LF,LF
                        IF      TEST
                        DB      '32'    ;32K EXAMPLE BIOS
                        ENDIF
                        IF      NOT TEST
169F 3030               DB      '00'    ;MEMORY SIZE FILLED BY RELOCATOR
                        ENDIF
16A1 6B2043502F         DB      'k CP/M vers '
16AD 322E32             DB      VERS/10+'0','.',VERS MOD 10+'0'
16B0 0D0A00             DB      CR,LF,0
                ;
                BOOT:   ;PRINT SIGNON MESSAGE AND GO TO CCP
                ;       (NOTE: MDS BOOT INITIALIZED IOBYTE AT 0003H)
16B3 310001             LXI     SP,BUFF+80H
16B6 219C16             LXI     H,SIGNON
16B9 CDD317             CALL    PRMSG   ;PRINT MESSAGE
16BC AF                 XRA     A       ;CLEAR ACCUMULATOR
16BD 320400             STA     CDISK   ;SET INITIALLY TO DISK A
16C0 C30F17             JMP     GOCPM   ;GO TO CP/M
                ;
                ;
                WBOOT:; LOADER ON TRACK 0, SECTOR 1, WHICH WILL BE SKIPPED FOR WARM
                ;       READ CP/M FROM DISK - ASSUMING THERE IS A 128 BYTE COLD START
                ;       START.
                ;
16C3 318000             LXI     SP,BUFF ;USING DMA - THUS 80 THRU FF AVAILABLE FOR STA
                ;
16C6 0E0A               MVI     C,RETRY ;MAX RETRIES
16C8 C5                 PUSH    B
```

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```
                WBOOT0: ;ENTER HERE ON ERROR RETRIES
16C9 010000             LXI     B,CPMB  ;SET DMA ADDRESS TO START OF DISK SYSTEM
16CC CDBB17             CALL    SETDMA
16CF 0E00               MVI     C,0     ;BOOT FROM DRIVE 0
16D1 CD7D17             CALL    SELDSK
16D4 0E00               MVI     C,0
16D6 CDA717             CALL    SETTRK  ;START WITH TRACK 0
16D9 0E02               MVI     C,2     ;START READING SECTOR 2
16DB CDAC17             CALL    SETSEC
                ;
                ;       READ SECTORS, COUNT NSECTS TO ZERO
16DE C1                 POP     B       ;10-ERROR COUNT
16DF 062C               MVI     B,NSECTS
                RDSEC:  ;READ NEXT SECTOR
16E1 C5                 PUSH    B       ;SAVE SECTOR COUNT
16E2 CDC117             CALL    READ
16E5 C24917             JNZ     BOOTERR ;RETRY IF ERRORS OCCUR
16E8 2A6C18             LHLD    IOD     ;INCREMENT DMA ADDRESS
16EB 118000             LXI     D,128   ;SECTOR SIZE
16EE 19                 DAD     D       ;INCREMENTED DMA ADDRESS IN HL
16EF 44                 MOV     B,H
16F0 4D                 MOV     C,L     ;READY FOR CALL TO SET DMA
16F1 CDBB17             CALL    SETDMA
16F4 3A6B18             LDA     IOS     ;SECTOR NUMBER JUST READ
16F7 FE1A               CPI     26      ;READ LAST SECTOR?
16F9 DA0517             JC      RD1
                ;       MUST BE SECTOR 26, ZERO AND GO TO NEXT TRACK
16FC 3A6A18             LDA     IOT     ;GET TRACK TO REGISTER A
16FF 3C                 INR     A
1700 4F                 MOV     C,A     ;READY FOR CALL
1701 CDA717             CALL    SETTRK
1704 AF                 XRA     A       ;CLEAR SECTOR NUMBER
1705 3C         RD1:    INR     A       ;TO NEXT SECTOR
1706 4F                 MOV     C,A     ;READY FOR CALL
1707 CDAC17             CALL    SETSEC
170A C1                 POP     B       ;RECALL SECTOR COUNT
170B 05                 DCR     B       ;DONE?
170C C2E116             JNZ     RDSEC
                ;
                ;       DONE WITH THE LOAD, RESET DEFAULT BUFFER ADDRESS
                GOCPM:  ;(ENTER HERE FROM COLD START BOOT)
                ;       ENABLE RST0 AND RST7
170F F3                 DI
1710 3E12               MVI     A,12H   ;INITIALIZE COMMAND
1712 D3FD               OUT     REVRT
1714 AF                 XRA     A
1715 D3FC               OUT     INTC    ;CLEARED
1717 3E7E               MVI     A,INTE  ;RST0 AND RST7 BITS ON
1719 D3FC               OUT     INTC
171B AF                 XRA     A
171C D3F3               OUT     ICON    ;INTERRUPT CONTROL
                ;
                ;       SET DEFAULT BUFFER ADDRESS TO 80H
171E 018000             LXI     B,BUFF
1721 CDBB17             CALL    SETDMA
                ;
```

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```
                ;       RESET MONITOR ENTRY POINTS
1724 3EC3               MVI     A,JMP
1726 320000             STA     0
1729 210316             LXI     H,WBOOTE
172C 220100             SHLD    1       ;JMP WBOOT AT LOCATION 00
172F 320500             STA     5
1732 210608             LXI     H,BDOS
1735 220600             SHLD    6       ;JMP BDOS AT LOCATION 5
                        IF      NOT TEST
1738 323800             STA     7*8     ;JMP TO MON80 (MAY HAVE BEEN CHANGED BY DDT)
173B 2100F8             LXI     H,MON80
173E 223900             SHLD    7*8+1
                        ENDIF
                ;       LEAVE IOBYTE SET
                ;       PREVIOUSLY SELECTED DISK WAS B, SEND PARAMETER TO CPM
1741 3A0400             LDA     CDISK   ;LAST LOGGED DISK NUMBER
1744 4F                 MOV     C,A     ;SEND TO CCP TO LOG IT IN
1745 FB                 EI
1746 C30000             JMP     CPMB
                ;
                ;       ERROR CONDITION OCCURRED, PRINT MESSAGE AND RETRY
                BOOTERR:
1749 C1                 POP     B       ;RECALL COUNTS
174A 0D                 DCR     C
174B CA5217             JZ      BOOTER0
                ;       TRY AGAIN
174E C5                 PUSH    B
174F C3C916             JMP     WBOOT0
                ;
                BOOTER0:
                ;       OTHERWISE TOO MANY RETRIES
1752 215B17             LXI     H,BOOTMSG
1755 CDD317             CALL    PRMSG
1758 C30FFF             JMP     RMON80  ;MDS HARDWARE MONITOR
                ;
                BOOTMSG:
175B 3F626F6F74         DB      '?boot',0
                ;
                ;
                CONST:  ;CONSOLE STATUS TO REG-A
                ;       (EXACTLY THE SAME AS MDS CALL)
1761 C312F8             JMP     CSTS
                ;
                CONIN:  ;CONSOLE CHARACTER TO REG-A
1764 CD03F8             CALL    CI
1767 E67F               ANI     7FH     ;REMOVE PARITY BIT
1769 C9                 RET
                ;
                CONOUT: ;CONSOLE CHARACTER FROM C TO CONSOLE OUT
176A C309F8             JMP     CO
                ;
                LIST:   ;LIST DEVICE OUT
                ;       (EXACTLY THE SAME AS MDS CALL)
176D C30FF8             JMP     LO
                ;
                LISTST:
```

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```
                        ;RETURN LIST STATUS
1770 AF                 XRA     A
1771 C9                 RET             ;ALWAYS NOT READY
                ;
                PUNCH:  ;PUNCH DEVICE OUT
                ;       (EXACTLY THE SAME AS MDS CALL)
1772 C30CF8             JMP     PO
                ;
                READER: ;READER CHARACTER IN TO REG-A
                ;       (EXACTLY THE SAME AS MDS CALL)
1775 C306F8             JMP     RI
                ;
                HOME:   ;MOVE TO H ME PLSITION
                ;       TREAT AS TRACK 00 SEEK
1778 0E00               MVI     C,0
177A C3A717             JMP     SETTRK
                ;
                SELDSK: ;SELECT DISK GIVEN BY REGISTER C
177D 210000             LXI     H, 000H ;RETURN 0000 IF ERROR
1780 79                 MOV     A,C
1781 FE04               CPI     NDISKS  ;TOO LARGE?
1783 D0                 RNC             ;LEAVE HL = 0000
                ;
1784 E602               ANI     10B     ;00 00 FOR DRIVE 0,1 AND 10 10 FOR DRIVE 2,3
1786 326618             STA     DBANK   ;TO SELECT DRIVE BANK
1789 79                 MOV     A,C     ;00, 01, 10, 11
178A E601               ANI     1B      ;MDS HAS 0,1 AT 78, 2,3 AT 88
178C B7                 ORA     A       ;RESULT 00?
178D CA9217             JZ      SETDRIVE
1790 3E30               MVI     A,00110000B     ;SELECTS DRIVE 1 IN BANK
                SETDRIVE:
1792 47                 MOV     B,A     ;SAVE THE FUNCTION
1793 216818             LXI     H,IOF   ;IO FUNCTION
1796 7E                 MOV     A,M
1797 E6CF               ANI     11001111B       ;MASK OUT DISK NUMBER
1799 B0                 ORA     B       ;MASK IN NEW DISK NUMBER
179A 77                 MOV     M,A     ;SAVE IT IN IOPB
179B 69                 MOV     L,C
179C 2600               MVI     H,0     ;HL=DISK NUMBER
179E 29                 DAD     H       ;*2
179F 29                 DAD     H       ;*4
17A0 29                 DAD     H       ;*8
17A1 29                 DAD     H       ;*16
17A2 113316             LXI     D,DPBASE
17A5 19                 DAD     D       ;HL=DISK HEADER TABLE ADDRESS
17A6 C9                 RET
                ;
                ;
                SETTRK: ;SET TRACK ADDRESS GIVEN BY C
17A7 216A18             LXI     H,IOT
17AA 71                 MOV     M,C
17AB C9                 RET
                ;
                SETSEC: ;SET SECTOR NUMBER GIVEN BY C
17AC 216B18             LXI     H,IOS
17AF 71                 MOV     M,C
```

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```
17B0 C9                 RET
                SECTRAN:
                        ;TRANSLATE SECTOR BC USING TABLE AT DE
17B1 0600               MVI     B,0     ;DOUBLE PRECISION SECTOR NUMBER IN BC
17B3 EB                 XCHG            ;TRANSLATE TABLE ADDRESS TO HL
17B4 09                 DAD     B       ;TRANSLATE(SECTOR) ADDRESS
17B5 7E                 MOV     A,M     ;TRANSLATED SECTOR NUMBER TO A
17B6 326B18             STA     IOS
17B9 6F                 MOV     L,A     ;RETURN SECTOR NUMBER IN L
17BA C9                 RET
                ;
                SETDMA: ;SET DMA ADDRESS GIVEN BY REGS B,C
17BB 69                 MOV     L,C
17BC 60                 MOV     H,B
17BD 226C18             SHLD    IOD
17C0 C9                 RET
                ;
                READ:   ;READ NEXT DISK RECORD (ASSUMING DISK/TRK/SEC/DMA SET)
17C1 0E04               MVI     C,READF ;SET TO READ FUNCTION
17C3 CDE017             CALL    SETFUNC
17C6 CDF017             CALL    WAITIO  ;PERFORM READ FUNCTION
17C9 C9                 RET             ;MAY HAVE ERROR SET IN REG-A
                ;
                ;
                WRITE:  ;DISK WRITE FUNCTION
17CA 0E06               MVI     C,WRITF
17CC CDE017             CALL    SETFUNC ;SET TO WRITE FUNCTION
17CF CDF017             CALL    WAITIO
17D2 C9                 RET             ;MAY HAVE ERROR SET
                ;
                ;
                ;       UTILITY SUBROUTINES
                PRMSG:  ;PRINT MESSAGE AT H,L TO 0
17D3 7E                 MOV     A,M
17D4 B7                 ORA     A       ;ZERO?
17D5 C8                 RZ
                ;       MORE TO PRINT
17D6 E5                 PUSH    H
17D7 4F                 MOV     C,A
17D8 CD6A17             CALL    CONOUT
17DB E1                 POP     H
17DC 23                 INX     H
17DD C3D317             JMP     PRMSG
                ;
                SETFUNC:
                ;       SET FUNCTION FOR NEXT I/O (COMMAND IN REG-C)
17E0 216818             LXI     H,IOF   ;IO FUNCTION ADDRESS
17E3 7E                 MOV     A,M     ;GET IT TO ACCUMULATOR FOR MASKING
17E4 E6F8               ANI     11111000B       ;REMOVE PREVIOUS COMMAND
17E6 B1                 ORA     C       ;SET TO NEW COMMAND
17E7 77                 MOV     M,A     ;REPLACED IN IOPB
                ;       THE MDS-800 CONTROLLER REQUIRES DISK BANK BIT IN SECTOR BYTE
                ;       MASK THE BIT FROM THE CURRENT I/O FUNCTION
17E8 E620               ANI     00100000B       ;MASK THE DISK SELECT BIT
17EA 216B18             LXI     H,IOS           ;ADDRESS THE SECTOR SELECT BYTE
17ED B6                 ORA     M               ;SELECT PROPER DISK BANK
```

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```
17EE 77                 MOV     M,A             ;SET DISK SELECT BIT ON/OFF
17EF C9                 RET
                ;
                WAITIO:
17F0 0E0A               MVI     C,RETRY ;MAX RETRIES BEFORE PERM ERROR
                REWAIT:
                ;       START THE I/O FUNCTION AND WAIT FOR COMPLETION
17F2 CD3F18             CALL    INTYPE  ;IN RTYPE
17F5 CD4C18             CALL    INBYTE  ;CLEARS THE CONTROLLER
                ;
17F8 3A6618             LDA     DBANK           ;SET BANK FLAGS
17FB B7                 ORA     A               ;ZERO IF DRIVE 0,1 AND NZ IF 2,3
17FC 3E67               MVI     A,IOPB AND OFFH ;LOW ADDRESS FOR IOPB
17FE 0618               MVI     B,IOPB SHR 8    ;HIGH ADDRESS FOR IOPB
1800 C20B18             JNZ     IODR1   ;DRIVE BANK 1?
1803 D379               OUT     ILOW            ;LOW ADDRESS TO CONTROLLER
1805 78                 MOV     A,B
1806 D37A               OUT     IHIGH   ;HIGH ADDRESS
1808 C31018             JMP     WAITO           ;TO WAIT FOR COMPLETE
                ;
                IODR1:  ;DRIVE BANK 1
180B D389               OUT     ILOW+10H        ;88 FOR DRIVE BANK 10
180D 78                 MOV     A,B
180E D38A               OUT     IHIGH+10H
                ;
1810 CD5918     WAITO:  CALL    INSTAT          ;WAIT FOR COMPLETION
1813 E604               ANI     IORDY           ;READY?
1815 CA1018             JZ      WAITO
                ;
                ;       CHECK IO COMPLETION OK
1818 CD3F18             CALL    INTYPE          ;MUST BE IO COMPLETE (00) UNLINKED
                ;       00 UNLINKED I/O COMPLETE,    01 LINKED I/O COMPLETE (NOT USED)
                ;       10 DISK STATUS CHANGED       11 (NOT USED)
181B FE02               CPI     10B             ;READY STATUS CHANGE?
181D CA3218             JZ      WREADY
                ;
                ;       MUST BE 00 IN THE ACCUMULATOR
1820 B7                 ORA     A
1821 C23818             JNZ     WERROR          ;SOME OTHER CONDITION, RETRY
                ;
                ;       CHECK I/O ERROR BITS
1824 CD4C18             CALL    INBYTE
1827 17                 RAL
1828 DA3218             JC      WREADY          ;UNIT NOT READY
182B 1F                 RAR
182C E6FE               ANI     11111110B       ;ANY OTHER ERRORS?  (DELETED DATA OK)
182E C23818             JNZ     WERROR
                ;
                ;       READ OR WRITE IS OK, ACCUMULATOR CONTAINS ZERO
1831 C9                 RET
                ;
                WREADY: ;NOT READY, TREAT AS ERROR FOR NOW
1832 CD4C18             CALL    INBYTE          ;CLEAR RESULT BYTE
1835 C33818             JMP     TRYCOUNT
                ;
                WERROR: ;RETURN HARDWARE MALFUNCTION (CRC, TRACK, SEEK, ETC.)
```

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```
                ;       THE MDS CONTROLLER HAS RETURNED A BIT IN EACH POSITION
                ;       OF THE ACCUMULATOR, CORRESPONDING TO THE CONDITIONS:
                ;       0       - DELETED DATA (ACCEPTED AS OK ABOVE)
                ;       1       - CRC ERROR
                ;       2       - SEEK ERROR
                ;       3       - ADDRESS ERROR (HARDWARE MALFUNCTION)
                ;       4       - DATA OVER/UNDER FLOW (HARDWARE MALFUNCTION)
                ;       5       - WRITE PROTECT (TREATED AS NOT READY)
                ;       6       - WRITE ERROR (HARDWARE MALFUNCTION)
                ;       7       - NOT READY
                ;       (ACCUMULATOR BITS ARE NUMBERED 7 6 5 4 3 2 1 0)
                ;
                ;       IT MAY BE USEFUL TO FILTER OUT THE VARIOUS CONDITIONS,
                ;       BUT WE WILL GET A PERMANENT ERROR MESSAGE IF IT IS NOT
                ;       RECOVERABLE.  IN ANY CASE, THE NOT READY CONDITION IS
                ;       TREATED AS A SEPARATE CONDITION FOR LATER IMPROVEMENT
                TRYCOUNT:
                ;       REGISTER C CONTAINS RETRY COUNT, DECREMENT 'TIL ZERO
1838 0D                 DCR     C
1839 C2F217             JNZ     REWAIT  ;FOR ANOTHER TRY
                ;
                ;       CANNOT RECOVER FROM ERROR
183C 3E01               MVI     A,1     ;ERROR CODE
183E C9                 RET
                ;
                ;       INTYPE, INBYTE, INSTAT READ DRIVE BANK 00 OR 10
183F 3A6618     INTYPE: LDA     DBANK
1842 B7                 ORA     A
1843 C24918             JNZ     INTYP1  ;SKIP TO BANK 10
1846 DB79               IN      RTYPE
1848 C9                 RET
1849 DB89       INTYP1: IN      RTYPE+10H       ;78 FOR 0,1  88 FOR 2,3
184B C9                 RET
                ;
184C 3A6618     INBYTE: LDA     DBANK
184F B7                 ORA     A
1850 C25618             JNZ     INBYT1
1853 DB7B               IN      RBYTE
1855 C9                 RET
1856 DB8B       INBYT1: IN      RBYTE+10H
1858 C9                 RET
                ;
1859 3A6618     INSTAT: LDA     DBANK
185C B7                 ORA     A
185D C26318             JNZ     INSTA1
1860 DB78               IN      DSTAT
1862 C9                 RET
1863 DB88       INSTA1: IN      DSTAT+10H
1865 C9                 RET
                ;
                ;
                ;
                ;       DATA AREAS (MUST BE IN RAM)
1866 00         DBANK:  DB      0       ;DISK BANK 00 IF DRIVE 0,1
                                        ;          10 IF DRIVE 2,3
                IOPB:   ;IO PARAMETER BLOCK
```

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```
1867 80                 DB      80H     ;NORMAL I/O OPERATION
1868 04         IOF:    DB      READF   ;IO FUNCTION, INITIAL READ
1869 01         ION:    DB      1       ;NUMBER OF SECTORS TO READ
186A 02         IOT:    DB      OFFSET  ;TRACK NUMBER
186B 01         IOS:    DB      1       ;SECTOR NUMBER
186C 8000       IOD:    DW      BUFF    ;IO ADDRESS
                ;
                ;
                ;       DEFINE RAM AREAS FOR BDOS OPERATION
                        ENDEF
186E+=          BEGDAT  EQU     $
186E+           DIRBUF: DS      128     ;DIRECTORY ACCESS BUFFER
18EE+           ALV0:   DS      31
190D+           CSV0:   DS      16
191D+           ALV1:   DS      31
193C+           CSV1:   DS      16
194C+           ALV2:   DS      31
196B+           CSV2:   DS      16
197B+           ALV3:   DS      31
199A+           CSV3:   DS      16
19AA+=          ENDDAT  EQU     $
013C+=          DATSIZ  EQU     $-BEGDAT
19AA                    END
```

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001F ALS1
001F ALS2
001F ALS3
18EE ALV0
191D ALV1
194C ALV2
197B ALV3
0078 BASE
0806 BDOS
186E BEGDAT
0000 BIAS
16B3 BOOT
1752 BOOTER0
1749 BOOTERR
175B BOOTMSG
0080 BUFF
0004 CDISK
F803 CI
1764 CONIN
176A CONOUT
1761 CONST
F809 CO
0000 CPMB
1600 CPML
000D CR
0010 CSS1
0010 CSS2
0010 CSS3
F812 CSTS
190D CSV0
193C CSV1
196B CSV2
199A CSV3
013C DATSIZ
1866 DBANK
186E DIRBUF
1673 DPB0
1673 DPB1
1673 DPB2
1673 DPB3
1633 DPBASE
1633 DPE0
1643 DPE1
1653 DPE2
1663 DPE3
0078 DSTAT
19AA ENDDAT
0000 FALSE
170F GOCPM
1778 HOME
00F3 ICON
007A IHIGH
0079 ILOW
1856 INBYT1
184C INBYTE
1863 INSTA1
1859 INSTAT
00FC INTC
007E INTE
1849 INTYP1
183F INTYPE
186C IOD
180B IOPR1
1868 IOF
1869 ION
1867 IOPB
0004 IORDY
186B IOS
186A IOT
000A LF
176D LIST
1770 LISTST
F80F LO
F800 MON80
002C NSECTS
0002 OFFSET
1600 PATCH
F80C PO
17D3 PRMSG
1772 PUNCH
007B RBYTE
1705 RD1
16E1 RDSEC
1775 READER
17C1 READ
0004 READF
0003 RECAL
000A RETRY
00FD REVRT
17F2 REWAIT
F806 RI
FF0F RMON80
0079 RTYPE
17B1 SECTRAN
177D SELDSK
17BB SETDMA
1792 SETDRIVE
17E0 SETFUNC
17AC SETSEC
17A7 SETTRK
169C SIGNON
0000 TEST
FFFF TRUE
1838 TRYCOUNT
0016 VERS
1810 WAIT0
17F0 WAITIO
16C9 WBOOT0
1603 WBOOTE
16C3 WBOOT
1838 WERROR
1832 WREADY
17CA WRITE
0006 WRITF
1682 XLT0
1682 XLT1
1682 XLT2
1682 XLT3

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